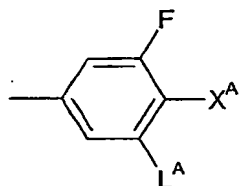


### Claims

1. Liquid crystal composition for bistable liquid crystal devices comprising a component ( $\pi$ ) said component ( $\pi$ ) containing one or more compounds having a phenyl ring of formula A



A

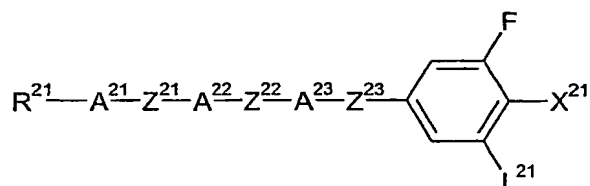
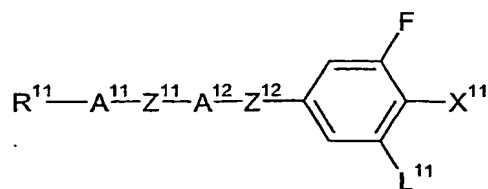
whereby

- X<sup>A</sup> is F, Cl, SF<sub>5</sub>, NCS, or a C<sub>1</sub> to C<sub>8</sub> alkanyl, alkenyl or alkoxy radical substituted with at least one F atom; and

L<sup>A</sup> is H or F.

2. Liquid crystal composition according to claim 1 characterized in that it is for zenithal bistable nematic liquid crystal devices.
3. Liquid crystal composition according to any one of the preceding claims characterized in that said composition comprises at least 60 weight% or more (based on the total weight of the composition) of said component ( $\pi$ ).
4. Liquid crystal composition according to any one of the preceding claims characterized in that in formula A X<sup>A</sup> is F or Cl.
5. Liquid crystal composition according to any one of claims 1 to 3 characterized in that said one or more compounds having a phenyl ring of formula A as defined in claim 1 are selected from the compounds of formula I and/or II

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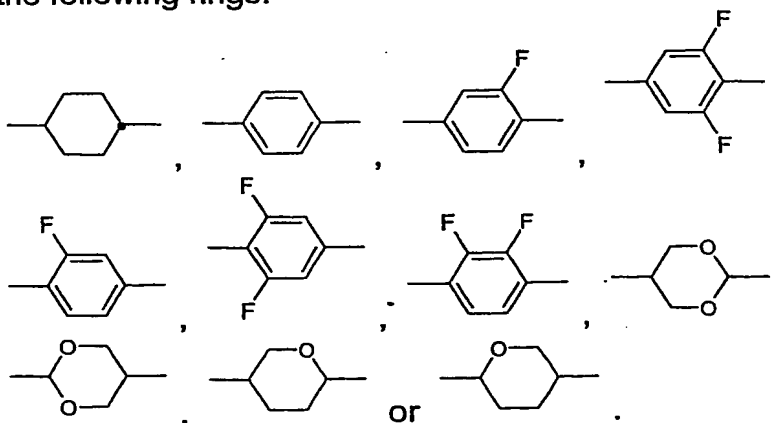
whereby

$R^{11}$  and  $R^{21}$  are independently of each other  $C_1$ - $C_{15}$  alkyl which is unsubstituted or mono- or poly-substituted with halogen and in which one or more of the  $\text{CH}_2$  groups may be replaced independently of each other by  $-\text{O}-$ ,  $-\text{S}-$ ,  $-\text{CH}=\text{CH}-$ ,  $-\text{C}\equiv\text{C}-$ ,  $-\text{CO}-\text{O}-$ ,  $-\text{OC}-\text{O}-$  such that there are no hetero atoms adjacent to each other;

$Z^{11}$ ,  $Z^{12}$ ,  $Z^{21}$ ,  $Z^{22}$ ,  $Z^{23}$  are independently of each other a single bond,  $-\text{CO}-\text{O}-$ ,  $-\text{O}-\text{CO}-$ ,  $-\text{CH}_2\text{O}-$ ,  $-\text{OCH}_2-$ ,  $-\text{CF}_2\text{O}-$ ,  $-\text{OCF}_2-$ ,  $-\text{CH}_2\text{CH}_2-$ ,  $(-\text{CH}_2\text{CH}_2-)_2$ ,  $-\text{CF}=\text{CF}-$ ,  $-\text{CF}_2\text{CF}_2-$ ,  $-\text{CH}_2\text{CF}_2-$ ,  $-\text{CF}_2\text{CH}_2-$ ,  $-\text{CH}=\text{CH}-$  or  $-\text{C}\equiv\text{C}-$ ;

$X^{11}$  and  $X^{21}$  are independently of each other is F, Cl,  $\text{SF}_5$ , NCS, or a  $C_1$  to  $C_8$  alkanyl, alkenyl or alkoxy radical substituted with at least one F atom;

$L^{11}$  and  $L^{21}$  are independently of each other H or F; and  $A^{11}$ ,  $A^{12}$ ,  $A^{21}$ ,  $A^{22}$  and  $A^{23}$  are independently of each other one of the following rings:



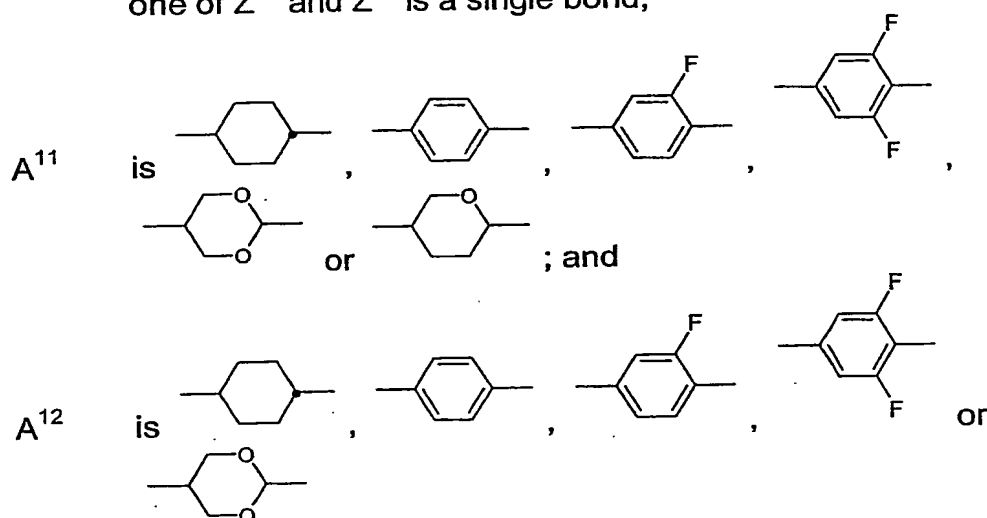
6. Liquid crystal composition according to the preceding claim characterized in that in formula I

$R^{11}$  is a  $C_1$  to  $C_8$  alkanyl, alkenyl or alkoxy radical unsubstituted or substituted with at least one F atom;

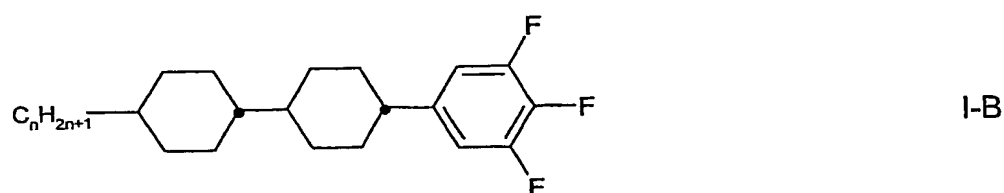
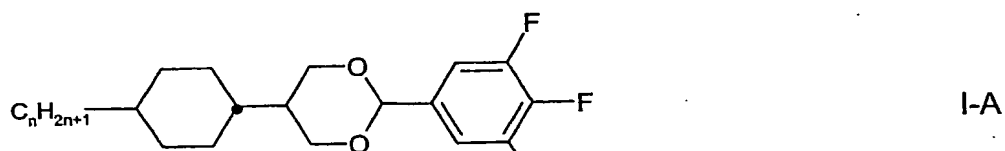
$L^{11}$  is H or F;

$X^{11}$  is F or Cl;

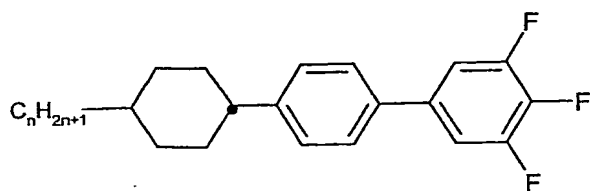
$Z^{11}$  and  $Z^{12}$  are a single bond,  $-CF_2O-$  or  $-CO-O-$  whereby at least one of  $Z^{11}$  and  $Z^{12}$  is a single bond;



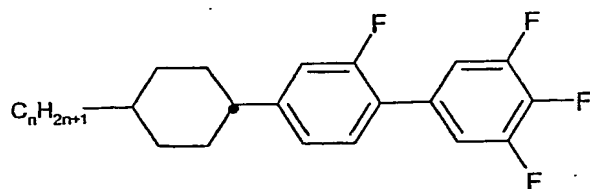
7. Liquid crystal composition according to the preceding claim characterized in that the compounds of formula I are selected from one or more of the following formulas:



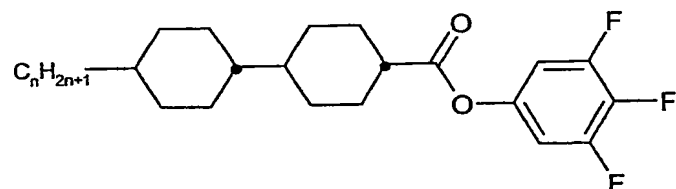
- 82 -



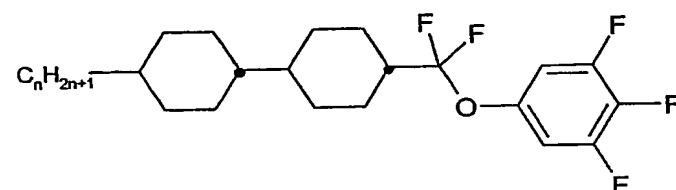
I-C



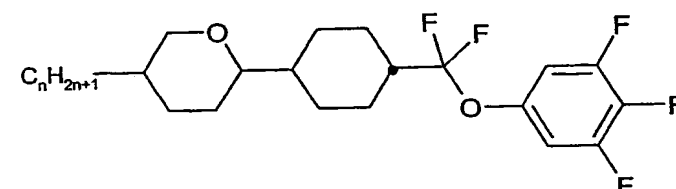
I-D



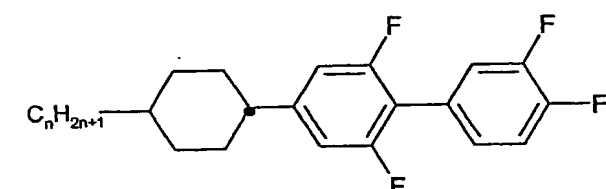
I-E



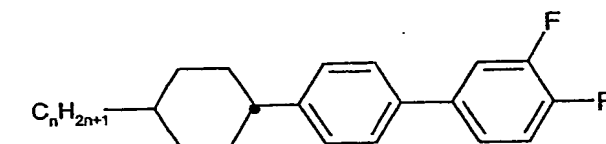
I-F



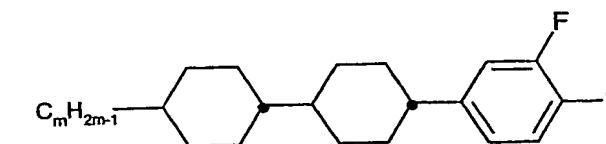
I-G



I-H



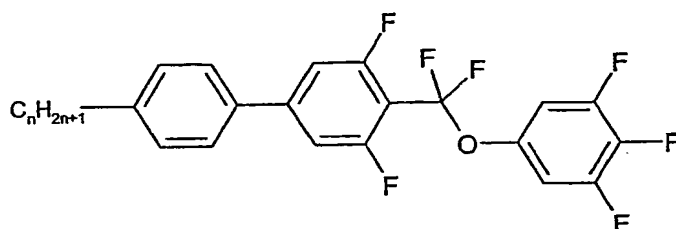
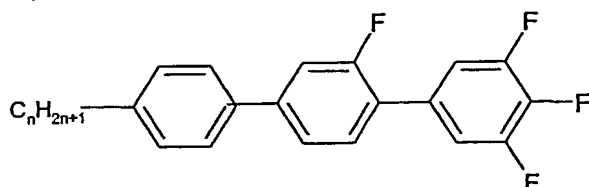
I-I



I-J

whereby  $n$  is an integer from 1 to 8; and  
 $m$  is an integer from 2 to 8.

8. Liquid crystal composition according to any one of claims 5 or 6 characterized in that the compounds of formula I are comprising compounds of the following formulas:



15 whereby

n is an integer from 1 to 8

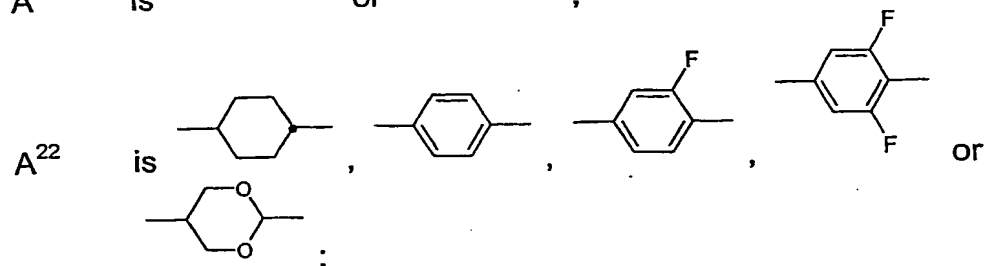
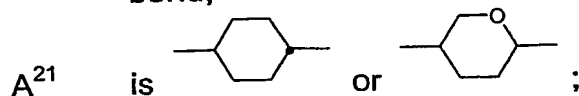
9. Liquid crystal composition according to any one of claims 5 to 8 characterized in that in formula II

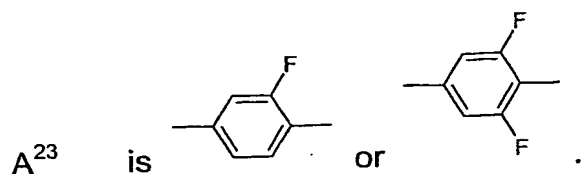
20  $R^{21}$  is a  $C_1$  to  $C_8$  alkanyl, alkenyl or alkoxy radical unsubstituted or substituted with at least one F atom;

$L^{21}$  is F;

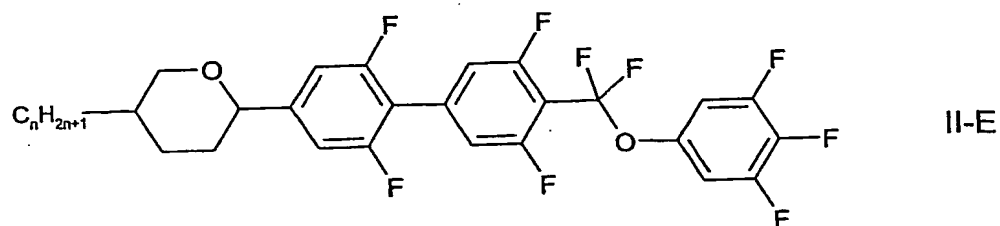
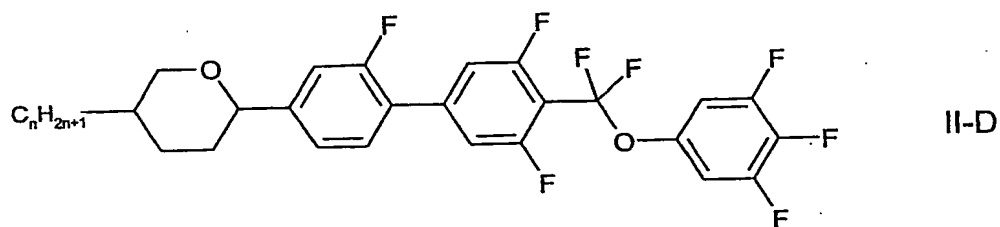
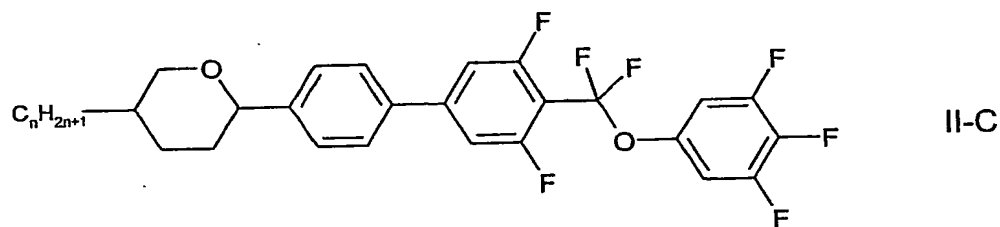
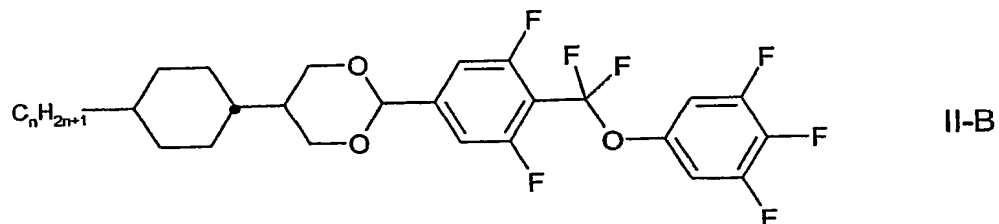
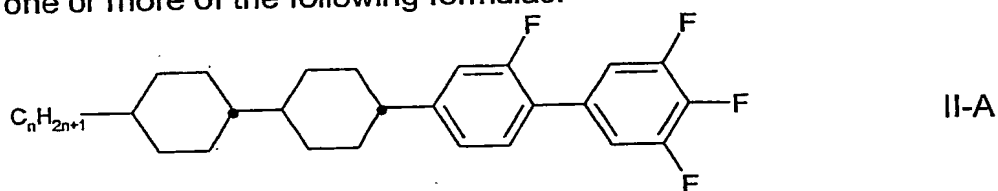
$X^{21}$  is F or Cl;

25  $Z^{21}$ ,  $Z^{22}$  and  $Z^{23}$  are each a single bond,  $-CF_2O-$  or  $-CO-O-$  whereby at least two of  $Z^{21}$ ,  $Z^{22}$  and  $Z^{23}$  are each a single bond;





10. Liquid crystal composition according to the preceding claim characterized in that the compounds of formula II are selected from one or more of the following formulas:

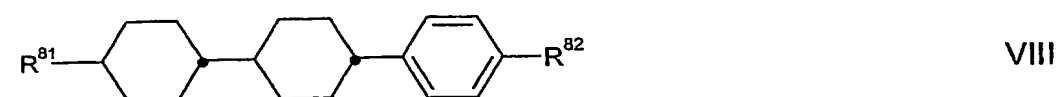
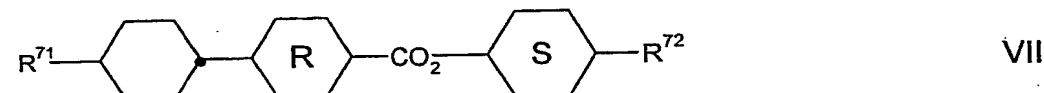
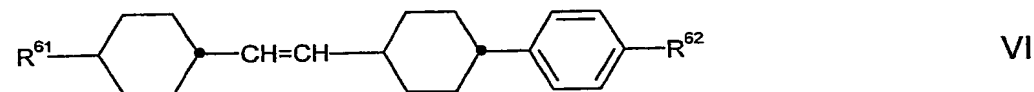
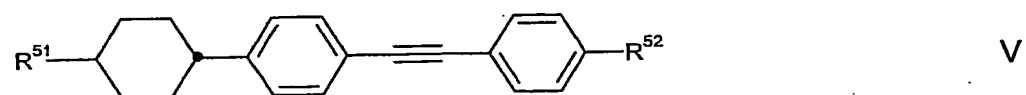
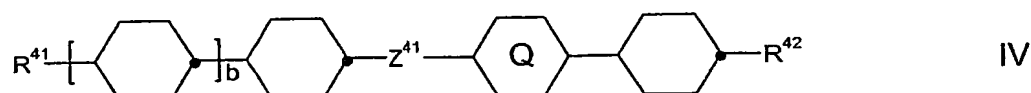
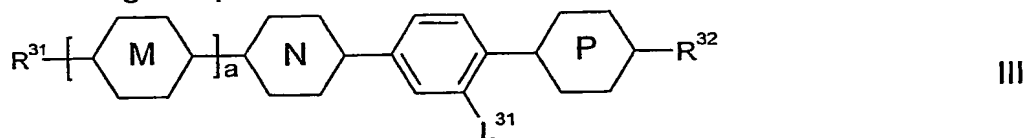


whereby

$n$  is an integer from 1 to 8

11. Liquid crystal composition according to any one of the preceding claims characterized in that it comprises 80 weight% or more (based on the total weight of the composition) of said component ( $\pi$ ).

5 12. Liquid crystal composition according to any one of the preceding claims characterized in that it further comprises one or more of the following compounds:



in which

a and b are independently of each other 0 or 1;

$R^{31}$ ,  $R^{32}$ ,  $R^{41}$ ,  $R^{42}$ ,  $R^{51}$ ,  $R^{52}$ ,  $R^{61}$ ,  $R^{62}$ ,  $R^{71}$ ,  $R^{72}$ ,  $R^{81}$  and  $R^{82}$

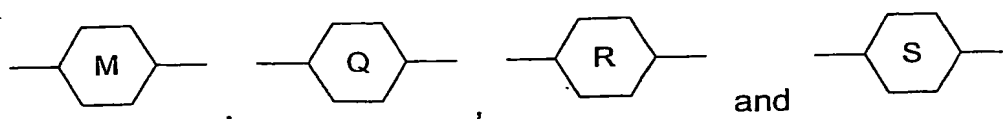
are independently of each other  $C_1$ - $C_{15}$  alkyl which is unsubstituted or mono- or poly-substituted with halogen

and in which one or more of the  $CH_2$  groups may be replaced independently of each other by  $-O-$ ,  $-S-$ ,  $-CH=CH-$ ,  $-C\equiv C-$ ,  $-CO-O-$ ,  $-OC-O-$  such that there are no hetero atoms adjacent to each other;

$L^{31}$  is H or F;

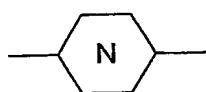
$Z^{41}$  is  $-CO-O-$ ,  $-CH_2O-$ ,  $-OCH_2-$ ,  $-CF_2O-$ ,  $-OCF_2-$ ,  $-CH_2CH_2-$ ,  $-CF_2CF_2-$ ,  $-CH_2CF_2-$ ,  $-CF_2CH_2-$ ,  $-CH=CH-$  or  $-C\equiv C-$ ;

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are independently of each other

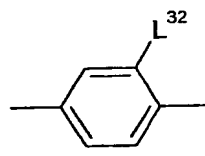
or ;



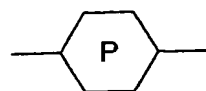
is



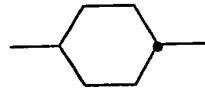
or



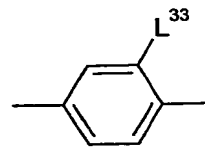
;



is

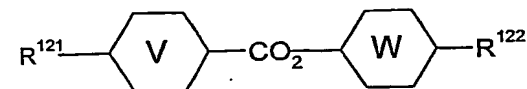
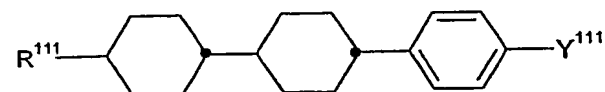
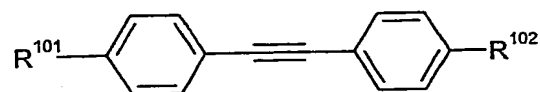
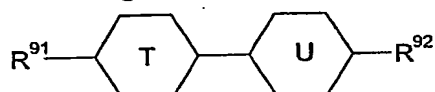


or



in which  $L^{32}$  and  $L^{33}$  are independently of each other H or F.

13. Liquid crystal composition according to any one of the preceding claims characterized in that it further comprises one or more of the following compounds:



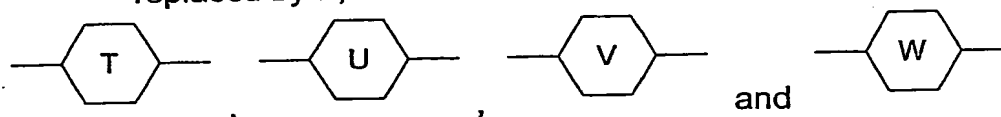
in which

$R^{91}$ ,  $R^{92}$ ,  $R^{101}$ ,  $R^{102}$ ,  $R^{111}$ ,  $R^{121}$  and  $R^{122}$

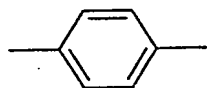
are independently of each other  $C_1$ - $C_{15}$  alkyl which is unsubstituted or mono- or poly-substituted with halogen and in which one or more of the  $CH_2$  groups may be replaced independently of each other by  $-O-$ ,  $-S-$ ,  $-CH=CH-$ ,  $-C\equiv C-$ ,

-CO-O-, -OC-O- such that there are no hetero atoms directly linked to each other; preferably these radicals are independently of each other straight-chain alkanyl, alkenyl or alkoxy radicals with up to 8 carbon atoms;

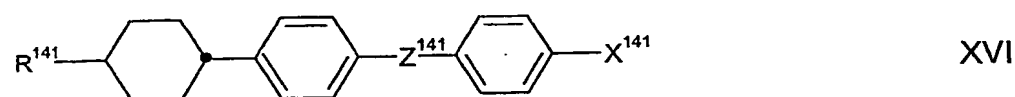
5  $\gamma^{111}$  is  $C_1$ - $C_{15}$  alkanyl or  $C_2$ - $C_{15}$  alkenyl that are independently of each other mono- or poly-substituted with halogen, or  $C_1$ - $C_{15}$  alkoxy which is mono- or poly-substituted with halogen; preferably it is an alkanyl or an alkoxy radical with up to 8 carbon atoms in which each of the hydrogen atoms are replaced by F; and



15 are independently of each other  or



- 20 14. Liquid crystal composition according to any one of the preceding claims characterized in that it further comprises one or more of the following compounds:



in which

30  $R^{131}$  and  $R^{141}$  are independently of each other  $C_1$ - $C_{15}$  alkyl which is unsubstituted or mono- or poly-substituted with halogen and in which one or more of the  $CH_2$  groups may be replaced independently of each other by -O-, -S-, -CH=CH-, -C≡C-, -CO-O-, -OC-O- such that there are no hetero atoms directly linked to each other; preferably these radicals are

35 independently of each other straight-chain alkanyl, alkenyl or alkoxy radicals with up to 8 carbon atoms;

$X^{131}$  and  $X^{141}$  are independently of each other F or Cl, preferably F; and  
 $Z^{131}$  and  $Z^{141}$  are independently of each other a single bond, -CF<sub>2</sub>O- or -CO-O-, preferably a single bond.

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## 15. Bistable liquid crystal device comprising

- two outer substrates which, together with a frame, form a cell;
  - a liquid crystal composition present in said cell;
  - electrode structures with alignment layers on the inside of said
- outer substrates whereby at least one alignment layer comprises an alignment grating that permits the compounds of said liquid crystal composition to adopt at least two different stable states whereby the assembly of said electrode structures with said alignment layers being such that in a first driving mode a switching between the said at least two different stable states is achieved by applying suitable electric signals to said electrode structures; characterized in that said liquid crystal composition is the composition according to any one of the preceding claims.

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## 16. Bistable liquid crystal device according to the preceding claim characterized in that it is a zenithal bistable nematic liquid crystal device.

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## 17. Bistable liquid crystal device according to any one of claims 15 and 16 characterized in that said first driving mode is an active matrix (AM) mode.

30

## 18. Bistable liquid crystal device according to any one of claims 15 to 17 characterized in that said device comprises electrode structures the assembly of which allowing said switching between said at least two different stable states in said first driving mode and a switching of said liquid crystal composition in a second monostable driving mode.

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## 19. Bistable liquid crystal device according to the preceding claim characterized in that said second monostable driving mode is an active matrix (AM) mode.

20. Bistable liquid crystal device according to the preceding claim  
characterized in that said second driving mode being a twisted  
nematic (TN) TFT mode or a vertically aligned nematic (VAN) TFT  
mode.

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